

CLAIMS:

1. An image forming apparatus, comprising:

at least one first image carrier configured to carry a
5 chromatic color toner image formed thereon;

a second image carrier configured to carry a black toner
image formed thereon;

at least one first gear configured to rotate to drive the
at least one first image carrier to rotate;

10 a second gear configured to rotate to drive the second
image carrier to rotate; and

a control device configured to control respective rotation
stop-positions of the at least one first gear and the second
gear,

15 wherein a color image is formed in a color mode by
transferring the chromatic color toner image formed on the at
least one first image carrier onto a transfer material and by
transferring the black toner image formed on the second image
carrier onto the transfer material while superimposing each
20 other on the transfer material, and a black image is formed in a
monochrome mode by halting the at least one first gear and the
at least one first image carrier and by transferring the black
toner image formed on the second image carrier onto the transfer
material, and

25 wherein the control device controls the at least one first
gear and the second gear to stop rotating at positions different

from rotation start-positions of the at least one first gear and the second gear, respectively, while maintaining a predetermined phase relation between the at least one first gear and the second gear in the color mode, and the control device controls the second gear to stop rotating at a position substantially equal to a rotation start-position of the second gear in the monochrome mode.

2. The image forming apparatus according to claim 1, wherein color registration of color images is performed in a registration mode, and wherein the control device controls the at least one first gear and the second gear to stop rotating at positions substantially equal to rotation start-positions of the at least one first gear and the second gear, respectively, while maintaining a predetermined phase relation between the at least one first gear and the second gear in the registration mode.

3. The image forming apparatus according to claim 1, wherein the control device comprises:

at least one first reference portion provided on the at least one first gear;

a second reference portion provided on the second gear;

at least two sensors configured to detect the at least one first reference portion and the second reference portion; and

a controller configured to control respective rotation stop-positions of the at least one first gear and the second

gear based on detection signals generated by the at least two sensors.

4. The image forming apparatus according to claim 1,
5 further comprising at least one drive motor configured to drive the at least one first gear and the second gear to rotate, wherein the at least one drive motor includes a stepping motor.

5. A multi-color image forming method, comprising:

10 rotating at least one first gear to drive at least one first image carrier to rotate in a color mode in which a color image is formed, and rotating a second gear to drive a second image carrier to rotate in the color mode and in a monochrome mode in which a black image is formed;

15 forming a chromatic color toner image on the at least one first image carrier in the color mode, and forming a black toner image on the second image carrier in the color mode and the monochrome mode;

transferring the chromatic color toner image formed on the
20 at least one first image carrier onto a transfer material and transferring the black toner image formed on the second image carrier onto the transfer material while superimposing on the transfer material in the color mode, and transferring the black toner image formed on the second image carrier onto the transfer
25 material in the monochrome mode; and

controlling the at least one first gear and the second gear
to stop rotating at positions different from rotation start-
positions of the at least one first gear and the second gear,
respectively, while maintaining a predetermined phase relation
5 between the at least one first gear and the second gear in the
color mode, and controlling the second gear to stop rotating at
a position substantially equal to a rotation start-position of
the second gear in the monochrome mode.

10 6. The method according to claim 5, further comprising:

controlling the at least one first gear and the second gear
to stop rotating at positions substantially equal to rotation
start-positions of the at least one first gear and the second
gear, respectively, while maintaining a predetermined phase
15 relation between the at least one first gear and the second gear
in a registration mode in which color registration of color
images is performed.

7. The method according to claim 5, further comprising:

20 causing the at least one first gear and the second gear to
equally shift by a predetermined rotation angle after a
predetermined number of black image forming operations are
continuously performed in the monochrome mode.

25 8. An image forming apparatus, comprising:

first image carrying means for carrying a chromatic color toner image formed thereon;

second image carrying means for carrying a black toner image formed thereon;

5 first rotating means for rotating to drive the first image carrying means to rotate;

second rotating means for rotating to drive the second image carrying means to rotate; and

control means for controlling respective rotation stop-
10 positions of the first rotating means and the second rotating means,

wherein a color image is formed in a color mode by transferring the chromatic color toner image formed on the first image carrying means onto a transfer material and by
15 transferring the black toner image formed on the second image carrying means onto the transfer material while superimposing each other on the transfer material, and a black image is formed in a monochrome mode by halting the first rotating means and the first image carrying means and by transferring the black toner
20 image formed on the second image carrying means onto the transfer material, and

wherein the control means controls the first rotating means and the second rotating means to stop rotating at positions different from rotation start-positions of the first rotating
25 means and the second rotating means, respectively, while maintaining a predetermined phase relation between the first

rotating means and the second rotating means in the color mode,
and the control means controls the second rotating means to stop
rotating at a position substantially equal to a rotation start-
position of the second rotating means in the monochrome mode.

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9. The image forming apparatus according to claim 8,
wherein color registration of color images is performed in a
registration mode, and wherein the control means controls the
first rotating means and the second rotating means to stop
10 rotating at positions substantially equal to rotation start-
positions of the first rotating means and the second rotating
means, respectively, while maintaining a predetermined phase
relation between the first rotating means and the second
rotating means in the registration mode.

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10. The image forming apparatus according to claim 8,
wherein the control means comprises:

at least one first reference portion provided on the first
rotating means;

20 a second reference portion provided on the second rotating
means;

detecting means for detecting the at least one first
reference portion and the second reference portion; and

controller means for controlling respective rotation stop-
25 positions of the first rotating means and the second rotating

means based on detection signals generated by the detecting means.

11. The image forming apparatus according to claim 8,
5 further comprising drive means for driving the first rotating means and the second rotating means to rotate, wherein the drive means includes a stepping motor.